CONTENTS

Culture and Mental Retardation:
Boris M. Levinson 27

Emotion and the Evaluative Feature of all Behavior:
S. Howard Bartley 39

Pattern Vision in Young Infants:
Robert L. Fantz 43

The Effect of Bulbocapnine Administration on Avoidance Behavior: *T. Verhave* and *John E. Owen, Jr.* 49

Perspectives in Psychology: *Paul Swartz* 53

The Psychological Record, 1958, 8, 27-38.

CULTURE AND MENTAL RETARDATION

BORIS M. LEVINSON

Yeshiva University

Today, extensive research is being carried on in mental deficiency (14), our nation's largest mental problem (22). In our eagerness to accumulate facts, no matter how minute, we seem to have lost our bearings and wander hither and thither, dependent upon the idiosyncrasy of the individual investigator. We seem to have lost sight of the forest because we are so busy examining the foliage of each tree. We must reexamine our basic postulates as to the causation of mental deficiency. It is only then that we can develop a feasible program of action.

Mental Retardation

It is to be noted that mental retardation has never been adequately defined (22). The writer considers mental retardation as referring to those children, who, while they have no organic defects of the nervous or endocrine system, function on an inferior level. These youngsters, when given an opportunity, may make an adequate social adjustment.

Mental retardation is not a disease entity. It is not a condition of general enfeeblement of a child's intellectual potential, but is symptomatic of many different aspects of maldevelopment. We do not have mentally retarded children. We have culturally deprived, or situationally or emotionally disturbed children. An understanding of this distinction would help in the proper grading of these children, would lead to a better method of treatment, and the possible eradication of mental retardation in our country.

Mental Deficiency

Mental deficiency, on the other hand, is defined as pertaining to youngsters, who, due to an intellectual deficit caused by maldevelopment or injury of the central nervous system, cannot, without adequate supervision and support, maintain themselves either in the community or in an institution. Whereas, there is a definite relationship between mental retardation and socio-economic factors (34), no such relationship exists with cases of diagnosed mental deficiency. We find these equally prevalent in all strata of society (59).

Furthermore, the difference in definitions is a question of emphasis. In the case of mental deficiency, the situation may be ameliorated but is considered essentially incurable. In the case of mental retardation, the condition is reversible and largely curable.

Incidence of Mental Retardation

Estimates of mental retardation and/or mental deficiency (this term is used interchangeably by the authorities) in the general population vary. This appears to depend upon the statistical orientation of the researcher and the level of education of the community. If the psychologist accepts the postulate of the normal distribution curve and also a certain IQ limit as being the critical point differentiating normality from mental defect, his estimate can be predicted.

According to Merrill (57), approximately 2.63 per cent of the population have IQ's below 70 and, thus, are mentally defective. In standardization of the Wechsler-Bellevue and the Wechsler Adult Intelligence Scale, Wechsler assumed that a certain percentage of the population was feebleminded, and selected his sample from institutions for mental defectives. In the case of the Wechsler-Bellevue he selected 3 per cent (86, p. 112), and for the Wechsler Adult Scale, 2 per cent (87, p. 7).

Pressey and Kuhlen (61) feel that 2 per cent of the school population are mentally defective. Kugelmass (53) states that approximately 1.5 per cent of the population are mentally retarded. Sloan (68) thinks the percentage to be somewhere between one to three per cent. Tredgold (82) estimates that 1.2 per cent of the school population of England are mentally deficient.

Mental retardation or mental deficiency seems to vary with the section of the country. Thus, it is larger in the South than in the North. It is least in states with good educational systems and most in states which are backward educationally (34).

It was estimated by the Mental Health Commission in 1953 and 1954 that in Onondaga County, N. Y., 3.5 per cent of the population from birth to age 18 were mentally retarded (88). The incidence of mental retardation in Philadelphia County is estimated as 2.32 per cent (26).

It appears that the incidence of mental retardation also varies with the age of the population. Up to age 5 the percentage is low; from age 5 to 13 the percentage rises until it reaches a peak at 13. After 13 years, the percentages slowly decrease (22). Penrose (59) points out in commenting on similar English findings, that this is due to the fact that it is during the school period that intellectual deficit is most evident.

Discovery of the Mentally Retarded Child

The mentally retarded child does not usually differ physically from the normal child. When you see him among other children, you can rarely pick him out. He is usually discovered in school (59). The teacher finds that he cannot readily learn, that he is poor in reading, in arithmetic, but may be average in penmanship. He may be good in such sensory-motor skills as shop-work, drawing and music. The teacher may try very hard, but the child, somehow or other, cannot adjust to scholastic demands and keeps on failing. He is then referred to a psychologist who diagnoses intellectual retardation.

Popularly Held Ideas Regarding Mental Retardation

In diagnosing mental retardation, the psychologist follows the culturally accepted ideas and theories regarding it. These are: (a) a definition of intelligence as being mainly a measure of scholastic aptitude and, as a correlate of this, using items highly predictive of school success, (b) the fatalistic theory of the normal distribution curve, under which a certain percentage of our population is "doomed" to an inferior intellectual status, (c) a concept of heredity as an important contributing factor to mental retardation, and (d) the supposition that unless a child can reach a minimum standard determined by the accomplishment of children his own age in certain abstract tasks, he most likely is retarded.

Let us analyze each one of these in turn:

What is Intelligence?

We have numerous definitions of intelligence and what intelligence tests measure, dependent upon the particular scientific orientation of the psychologist using this term. We can, thus, have a variety of valid "intelligence" tests designed to suit the particular needs of the investigator. The test used most widely in the diagnosis of mental retardation among school children is the Binet. This test measures *scholastic ability* and was originally and primarily designed to select children who cannot do well in their studies (1). In this area it is an instrument *par excellence*. However, it fails very miserably, as we will see, in other areas.

Abilities Tested in Intelligence Tests

The test items the child is exposed to are culturally conditioned (40) and, as such, are usually aimed at the child who comes from a middle-class background (46). If the child comes from a low socio-economic level, he is at a disadvantage. For example, the acceptance of our norms of beauty as a sign of intelligence on the 4.5 year level means knowing that having a Grecian nose is more beautiful than having a curved flat one (76). Since our concepts of beauty vary greatly, a child who comes from a different subculture finds himself misjudged. We find that children who are well born do comparatively better on tests involving thinking and reasoning than do children who come from poor homes (47, 64). Performance of all these tasks, in other words, would greatly depend upon the subculture in which the child was brought up.

It is further well known, however, that some of the abilities which are used as a touchstone in differentiating the bright child from the dull are largely a matter of exposure to certain activities (46, 54). Harris (45), for example, indicates that learning to read will depend upon reading readiness. Brueckner (13) stresses that learning to do arithmetic will depend upon arithmetic readiness. These, in turn, are developed as a result of home and social preschool activities to which the child is exposed (13, 45).

We find that the so-called mental defective usually does better than a normal child of similar mental age in non-scholasic tasks which require a response to a visual stimulus and do not require an oral response (77). This is most likely due to the bitter disappointment the retarded had in school and to the differentiation of abilities on the basis of experience. A mentally retarded child's score on an intelligence test predicts very poorly, if at all, his accomplishment after training in an industrial job (15, 16, 17, 20, 51, 58). The inescapable conclusion is that our intelligence tests have different validity for our mentally retarded than for so-called normal children.

The Fatalistic Theory of the Normal Distribution Curve

We find that many authorities have posited that some cases of mental deficiency (e.g., mental retardation) are due to the child's belonging to the lower level of the normal distribution curve. Lewis (55), for example, divides aments into two categories: feebleminded subcultural defectives, and pathological defectives. He remarks that the feebleminded person is an inherited normal variation. He is not abnormal, but merely endowed with less intelligence. The difference is a quantitative, not a qualitative one. Roberts (62) feels that the feebleminded (corresponding to our definition of mentally retarded) are at the lower end of the normal curve of distribution of intelligence. This, too, is an inherited condition (62).

While the writer makes no claim for any particular theory of intelligence distribution, he cannot accept the implicit assumption regarding the existence of the normal distribution curve and its corollary that certain children will inevitably find themselves at the tail end of the distribution.

This hypothesis runs contrary to psychological theory and experimental findings. First, we have more children at the tail end than can be accounted for in terms of normal distribution. Second, the form of a distribution depends upon the characteristics of the groups, difficulty of items, units of measurement, etc., (31). Third, we do not have an equality of cultural opportunities. Fourth, by changing the unit of measurement, we can change the form of distribution. When we are able to derive an equal unit scale of measurement, which is not based upon *a priori* assumptions regarding distribution of intelligence, when every child in our country has an equal opportunity for development, when a truly representative sample of the population is secured — it is only then that we will learn the exact slope of the curve of intelligence.

Heredity

A perusal of the literature on the inheritance of the higher forms (garden variety) of mental deficiency indicates that the field is in a state of confusion, almost chaos. While there has been a steady decline in the estimate of the percentage of mental defect due to heredity (83), we can find an authority in the field ready to support any point of view we may adopt. Estimates of the influence of heredity on mental retardation vary from 1.7 per cent to 90 per cent (83). The writer feels that considering heredity as a factor in mental retardation serves only to confuse the issue.

Studies have shown that when the environment is unfavorable, there is negative correlation between IQ and age (2, 25, 65). Gordon's (43) pioneer study of the canal boys and the gypsy children in England indicated that the older these children were, the lower were their IQ's. The fathers of the highest grades of the mentally defective come almost solely from semi-skilled and unskilled groups (12).

Klineberg's (52) research has shown that the IQ's of Negro children who came to New York City increased with their length of residence in the city. Another study indicated that the intelligence of sixth grade children in 30 middle-sized communities is related to the income and "goodness" of the communities involved (78). Furthermore, studies of adopted children imply that their IQ's do not depend upon that of their mothers, but upon the socio-economic and cultural level of their foster parents (29, 67).

Need we wonder that the ratio of retarded children to "normal expectancy" is .14 among professionals and 1.53 among the unskilled (56), or that the IQ increases as we go up the social pyramid (76), or that, knowing what a child's socio-economic level is, we can predict what the IQ of his group would be (46)?

Incidentally, a follow-up of the adjustment of adults who were earlier judged to be mentally deficient indicated that their children progressed through school at a normal rate and that their intelligence test scores were within the average range (15). Furthermore, in studies made in this country (10) and in England (16, 17), the social adequacy of the mentally retarded, after they have had training in special classes, has been shown to be almost on a par with that of the normal population.

Developmental Factors

The developmental factors which may occasionally account for mental retardation are: (a) undiagnosed organic involvement of the nervous system, (b) inadequate physical development, and (c) uneven mental development.

Organic Factors

The reader may well ask about children who have had good cultural backgrounds, came from good homes, showed no signs of neurological damage, but yet, are mentally retarded. How can this be explained? The writer's thesis is that these children had been misdiagnosed, that they had suffered undetected organic injury (7, 9, 11, 50, 85) and, thus, belong to our category of mental defectives. Ford (28) indicates that there are many cases in which serious lesions of the brain have been found at post-mortem, yet were not suspected while the patient was alive. Benda (8), in a post-mortem study of 20 institutionalized, garden variety mental defectives, found that most of them had developmental anomalies. Gesell, too, mentions that "in many instances the symptoms of minimal injury are so benign that they escape attention" (32). Furthermore, Schilder (63) found that many children who have been referred because of inability to learn to read are unable to do so because of brain injuries. These, too, are sometimes classified as garden variety cases of mental retardation. In this connection, in the writer's experience many cases of mental retardation that appeared to be due to neurological defects, on the basis of psychological tests, were found to be completely negative in a neurological examination. The writer's hypothesis is that psychological tests are sometimes more sensitive to underlying organic damage than the grosser neurological examination.

Physical Development

A child's physical development, frequently affected by his socio-economic background, has a bearing on his intellectual ability. The duller child tends to be somewhat undernourished and underweight (6). The reason for this becomes obvious when we realize that a disproportionately large number of retarded children come from a poor socio-economic background (56) where they receive neither proper nourishment nor proper mothering. Expectant mothers who cannot provide adequately for their offspring become anxious. This, in turn, has a deleterious effect on the fetus and leaves permanent physiological and psychological effects (69). When the mother suffers from a diet deficiency, the baby will fail to obtain the nourishment it needs (80). A study has shown that mothers who had adequate diets had less miscarriages, premature births, and spent less time in labor. The neonates of the mothers who had good diets had better health records and fewer illnesses during the first six months (23, 24). It need not surprise us to find that children from privileged homes are advanced approximately one year, and underprivileged children retarded, frequently, one year in skeletal growth, as compared to the average (79). Sometimes, a working mother neglects the child. This deprivation of parental attention, care and love may affect the child's physical development unfavorably (5). An undersized, weak child cannot compete on an equal level with his peers. Many of his playmates will be cruel to him, since he deviates so much from them (69). He is not as popular nor as socially successful, and lacks the leadership abilities of his peers (4). As a result, he may develop a feeling of inferiority, thinks himself stupid and, consequently, reduces his level of aspiration and his ability to handle scholastic tasks.

Uneven Mental Development

Some children develop mentally at a slower pace but, later on, the rate of their mental growth increases, and they may eventually surpass the average child (42, 48). Such a child, upon entering into the usual school environment may not be prepared for the school work offered to him. His parents become concerned over lack of scholastic progress and begin to insist upon the development of skills for which he is not ready. The child, wishing to please his parents, tries hard, fails, and develops a self-concept of intellectual inadequacy. Later on, when he is already able to master the work presented to him, the learning situation having become charged with tension, he is unable to learn and is conditioned to failure. The same child may succeed in the area of social relationships, since ability or inability to get along socially never held a threat to his ego. He adjusts socially in the world of his peers and makes a good vocational adjustment. Thus, we find many studies reporting on the excellent (considering their socio-economic background) occupational and social adjustment of the mentally retarded in their adult years (10, 15, 16, 17, 51, 58, 60).

Emotional Factors

Every retarded child sees his world in terms of his previous experiences, which may be general for his particular subgroup and yet, unique for himself. The child sees the low esteem in which he is held in child society because of his low socio-economic level (84). He introjects this point of view and believes that he is less desirable than a child who is well born. This feeling of inferiority may also extend itself to the intellectual area (3). It is to be remembered that the self-concept of capacity, and teachers' and parents' judgment, may coincide because they are based on a common basis of perceptual experience (18). When a child fails in a skill important to his group, it may make him feel inferior and dull. He will see himself as being very stupid, of no account, and he may not attempt a task later on which may be very well within his capacity.

This is confirmed in a study of the constancy of IQ's. It was found that "children whose mental test scores showed the most marked fluctuations had like histories which showed unusual variations with respect to disturbing and stabilizing factors" (48).

Social Deprivation

Social deprivation with its various concomitants, such as emotional retardation, is also an extremely important causative factor in mental retardation. The writer, for example, considers that the difficulty experts have in diagnosing the garden variety of mental defectives in infancy (the ones to which Lewis (55) and Roberts (62) refer as being on the tail end of the normal distribution curve) is due to the fact that *these children are normal.* It is only later, when the effect of the deplorable conditions (81) under which they live has brought about deviant personality traits and attitudes, that they perform on a defective level on our intelligence tests.

It is well known that personality traits have a bearing on the intellectual functioning of children (30). It is also observed that children of a lower socio-economic level do not have as many desirable personality traits as children who come from a higher socio-economic level. For instance, studies have indicated that lower-class children were not as energetic, persistent, and cheerful as middle-class children, that they cheated more, were uninterested in school,

and had more temper outbursts (44, 73). A study by Stagner indicated that poor children are more likely to feel inferior, be nervous, and socially passive (74). Furthermore, some of these children live in a subculture having deviant values. There is no drive towards improvement of one's social status. Consequently, these children do not prize intellectual skills and, as a result, unusual abilities and disabilities are developed.

Social deprivation varies in degree from very severe to mild. We can say that, generally speaking, there are two degrees of social deprivation: (a) severe and not reversible, and (b) moderate, which is somewhat reversible.

Severe Social Deprivation — Not Reversible

We find a few cases of severe social deprivation on record. Victor, the "Wild Boy of Aveyron," was captured in a forest in France in 1799. He managed to survive in the woods for years without any human contact. He was a "degraded being, human only in shape—who trotted and grunted like the beasts of the field" (49). Itard describes very graphically his patient and very ingenious methods of training Victor, and his almost complete failure. He attributed this to the fact that Victor was an idiot. Itard, in this conclusion, disregarded the role that social stimulation plays in the early formative years.

Gesell (33) discusses the case of a feral child, a girl who was found living in a wolf's den. This child (and her sister) displayed in her actions her affinity with wolves. It was difficult for this child to develop into a normal human being in spite of the loving care bestowed upon her by an Indian missionary, to whose house she was removed. At her death, after twelve years with the missionary's family, she still was not quite human.

Davis (19) describes the case of a child who was isolated in an attic for the first five years of her life. In spite of removal to a normal environment, the child remained mentally retarded.

Moderate Social Deprivation — Somewhat Reversible

We find moderate social deprivation very widespread in institutional settings. Over a period of months there are frequent changes in the staff caring for the child. Thus, the child does not have a good opportunity for continuous, intensive, or intimate contact with specific adults. Relationships are dim and fleeting. The opportunity for warmth and affection from the same adult person is minimal (36). Gesell (32) discusses the "standardized impacts" on the institutional child which limit his reactions. He stresses that the inconsistency with which an institutional child is handled by different attendants, his being stimulated at psychologically improper times, serves to impoverish the child. Goldfarb (35, 36, 37, 38, 39, 40, 41), in his comparative studies of children who were brought up in institutions and in foster homes, found that institutionalized children received lower test scores and were more maladjusted. They were unable to empathize with others and to maintain more than surface personal relationships. They also had a larger number of mental defectives. Goldfarb states that "cold isolated depriving experiences during the first months of life impede the normal development of such qualities as personal security and independence" (35). However, given the proper environmental stimulation, most of these children improve. A study was made of the change in IQ of retarded children who were placed in an institution for mental defectives where they had plenty of love, attention, and stimulation, as compared with the change in another group of

somewhat similar intelligence which, while having very good physical care in an orphanage, did not have this stimulation. The experimental group made an average gain of 27.5 IQ points while the control group had an average loss of 26.2 IQ points (66). Similarly, a comparison of the intelligence of children who had spent their first three years in an institution, with controls who had not, has shown that the control group had a mean IQ of 95.4 and the institutional group a mean IQ of 72.4 (36).

Spitz compared children (70, 71, 72) in an institution where they had good care by their own mothers with other children in similar institutions where children were handled impersonally by nurses. He found that the children who had an emotional interchange with their mothers were better in perception, memory, manipulative ability, and intelligence.

Goldfarb (38) found that orphans brought up in foster homes were brighter than orphans brought up in institutions, even though the mothers of the children in institutions were more adequate in terms of vocational and educational achievement and intelligence. The institutionalized children showed poor concept formation, reasoning, and abstract ability. This intellectual lag continued until adolescence, even though later, these children were placed in good foster homes.

Similarly, studies have shown that there was an increase in the IQ of children who were removed from parents of low IQ and placed in a favorable environment. There appeared to be some relation existing between the time of removal from parents of inferior intelligence and the increase in IQ. The earlier the separation from parents, the greater the subsequent increase in IQ (29, 67).

Phelps (60) reports a study of the post-school adjustment of 163 retarded children, whose median IQ was 60.6 and whose median age was 21.7 years. These youths had been in a special class for 3.4 years after being admitted at the median age of 12.7. He found that they made a good adjustment after leaving school; 67.5 per cent were employed, 11 per cent were housewives, 11 per cent were in the armed forces, and only 10.5 per cent had never been employed. The employers, on the whole, were satisfied with their services and, apparently, did not think that these workers were worse than any others.

SUMMARY

This paper analyzes the cultural forces which produce mental retardation. A distinction is made between *mental deficiency*, caused by a maldevelopment or injury of the nervous system, and *mental retardation*, which is a cultural by-product similar to poverty or delinquency.

Evidence is presented to show that:

(a) the diagnosis of mental retardation, which typically is first discovered in school, is based upon tests defining intelligence as being mainly a measure of scholastic aptitude, and standardized on the theory of the normal distribution of intelligence.

(b) the incidence of mental retardation varies, dependent upon the statistical orientation of the researcher, the age of the population, the education of the community, and whether the population considered is urban or rural.

(c) the children who have been diagnosed as mentally retarded come, in

the majority of cases, from deprived families, and may have inadequate physiques and personality disorders.

(d) the key to the solution of the problem of mental retardation lies in the remediation of the social and cultural forces surrounding the retardate.

REFERENCES

1. ANASTASI, A. *Psychological testing.* New York: McMillan, 1954.
2. ASHER, E. J. The inadequacy of current intelligence tests for testing Kentucky Mountain children. *J. genet. Psychol.*, 1935, 46, 480-486.
3. AXLINE, V. M. Mental deficiency, symptom or disease. *J. consult. Psychol.*, 1949, 13, 313-327.
4. BAKER, H. C., WRIGHT, B. A., MEYERSON, L., & GONICK, M. R. *Adjustment to physical handicap and illness: A survey of the social psychology of physique and disability.* New York: Social Science Research Council, 1953.
5. BAKWIN, M. Loneliness in infants. *Amer. J. Dis. Child.*, 1942, 63, 30-40.
6. BALDWIN, B. T. The physical growth of children from birth to maturity. *Univer. Iowa Stud. Child Welf.*, 1921, 1, No. 1.
7. BECK, H. S. The incidence of brain injury in public school classes for the educable mentally handicapped. *Amer. J. ment. Defic.*, 1956, 60, 818-822.
8. BENDA, C. E. The familial imbecile or oligo-encephaly as a morbid entity. *Amer. J. ment. Defic.*, 1944, 49, 32-42.
9. BENDA, C. E., & FARRELL, M. J. Psychopathology of mental deficiency in children. In Hoch, P. H., & Zubin, J. (Eds.) *Psychopathology of childhood.* New York: Grune & Stratton, 1955, Pp. 56-81.
10. BOBROFF, A. A survey of social and civic participation of adults formerly in classes for mentally retarded. *Amer. J. ment. Defic.*, 1956, 61.
11. BRADLEY, C. Organic factors in psychopathology of childhood. In Hoch, P. H., & Zubin, J. (Eds.) *Psychopathology of childhood.* New York: Grune & Stratton, 1955, Pp. 82-104.
12. BRADWAY, K. P. Paternal occupational intelligence and mental deficiency. *J. appl. Psychol.*, 1935, 19, 527-542.
13. BRUECKNER, L. J., & GROSSNICKLE, F. E. *Making arithmetic meaningful.* Chicago: John C. Winston Co., 1953.
14. CANTOR, G. N. Mental deficiency: scientific progress and theoretical confusion. *Contemp. Psychol.*, 1957, 2, 180-182.
15. CHARLES, D. C. Ability and accomplishment of persons earlier judged mentally deficient. *Genet. Psychol. Monogr.*, 1953, 47, 3-71.
16. COLLMAN, R. D., & NEWLYN, D. Employment success of educationally subnormal ex-pupils in England. *Amer. J. ment. Defic.*, 1956, 60, 733-743.
17. COLLMAN, R. D., & NEWLYN, D. Leisure activities of educationally subnormal and other ex-pupils in England. *Amer. J. ment. Defic.*, 1957, 62, 464-469.
18. COMBS, A. W. Intelligence from a perceptual point of view. *J. abnorm. soc. Psychol.*, 1952, 47, 662-673.
19. DAVIS, K. Extreme social isolation of a child. *Amer. J. Sociol.*, 1940, 45, 554-565.
20. DiMICHAEL, S. G. Vocational rehabilitation works for the mentally retarded. *Personn. Guid. J.*, 1953, 31, 428-432.
21. DOLL, E. A. Is mental deficiency curable? *Amer. J. ment. Defic.*, 1947, 51, 420-428.
22. DUHL, L. J. Mental retardation: A review of mental health implications. *Amer. J. ment. Defic.*, 1957, 62, 5-13.
23. EBBS, J. H., TISDALL, F. F., & SCOTT, W. A. The influence of prenatal diet on the mother and child. *The Milbank Memorial Fund Quart.*, 1942, 20, 35-36.

24. EBBS, J. H., BROWN, A., TISDALL, F. F., MOYLE, W. J., & BELL, M. The influence of improved prenatal nutrition upon the infant. *Canad. M.A.J.*, 1942, 6-8.

25. EDWARDS, A. S., & JONES, L. An experimental and field study of North Georgia mountaineers. *J. soc. Psychol.*, 1938, 9, 317-333.

26. FERGUSON, R. G. A study of the problem of mental retardation in a large urban community. *Amer. J. Orthopsychiat.*, 1957, 27, 490-501.

27. FINLAYSON, A. B. Social and economic background of retarded children. *J. educ. Sociol.*, 1941, 15, 38-45.

28. FORD, F. R. *Diseases of the nervous system in infancy, childhood, and adolescence.* (2nd ed.) Springfield, Ill.: Charles C. Thomas, 1944.

29. FREEMAN, F. N., HOLZINGER, K. J., & MITCHELL, B. C. The influence of environment on the intelligence, school achievement and conduct of foster children. *Twenty-seventh Yearbook of the National Society for the Study of Education.* 1928, 1, 101-217.

30. FROMM, E. H., DUMAS, L., & MARSCHAK, M. Children's intelligence tests as a measure of dynamic personality functioning. *Amer. J. Orthopsychiat.*, 1957, 27, 134-144.

31. GARRETT, H. E. *Statistics in psychology and education.* (4th ed.) New York: Longmans, Green & Co., 1953.

32. GESELL, A., & AMATRUDA, C. S. *Developmental diagnosis.* (2nd ed.) New York: Hoeber, 1947.

33. GESELL, A. *Wolf child and human child.* New York: Harper & Brothers, 1941.

34. GINSBERG, E., & BRAY, D. W. *The uneducated.* New York: Columbia University Press, 1953.

35. GOLDFARB, W. Variations in adolescent adjustment of institutionally reared children. *Amer. J. Orthopsychiat.*, 1947, 17, 449-457.

36. GOLDFARB, W. Emotional and intellectual consequences of psychologic deprivation in infancy: A revaluation. In Hoch, P. H., & Zubin, J. (Eds). *Psychopathology of childhood.* New York: Grune & Stratton, 1955, Pp. 105-120.

37. GOLDFARB, W. Infant rearing and problem behavior. *Amer. J. Orthopsychiat.*, 1943, 13, 249-265.

38. GOLDFARB, W. The effects of early institutional care on adolescent personality. *J. exp. Educ.*, 1943, 12, 106-129.

39. GOLDFARB, W. Infant rearing as a factor in foster home placement. *Amer. J. Orthopsychiat.*, 1944, 14, 162-166.

40. GOLDFARB, W. Effects of psychological deprivation in infancy and subsequent stimulation. *Amer. J. Psychiat.*, 1945, 102, 18-33.

41. GOLDFARB, W. Psychological deprivation in infancy and subsequent adjustment. *Amer. J. Orthopsychiat.*, 1945, 15, 247-255.

42. GOODENOUGH, F. H., & MAURER, K. M. *The mental growth of children from two to fourteen years: a study of the predictive value of the Minnesota Preschool Scales.* Minneapolis: University of Minnesota Press, 1942.

43. GORDON, H. Mental and scholastic tests among retarded children: An inquiry into the effects of schooling on the various tests. *Educ. Pamphlets Bd. Educ.*, London: 1923, No. 44.

44. GOUGH, H. G. The relationship of socio-economic status to personality inventory and achievement test scores. *J. educ. Psychol.*, 1946, 37, 527-540.

45. HARRIS, A. J. *How to increase reading ability.* (3rd ed.) New York: Longmans, Green & Co., 1956.

46. HAVIGHURST, R. J., & BREESE, F. H. Relation between ability and social status in a midwestern community. III. Primary mental abilities. *J. educ. Psychol.*, 1947, 38, 241-247.

47. HERRICK, V. E. What is already known about the relation of the IQ to cultural background? In Eells, K., Davis, A., et al. *Intelligence and cultural differences.* Chicago: University of Chicago Press, 1951, Pp. 10-15.

48. HONZIK, M. P., MacFARLANE, J. W., & ALLEN, L. The stability of mental test performance between two and eighteen years of age. *J. exp. Educ.*, 1948, 18, 309-324.

49. ITARD, J. M. G. *The wild boy of Aveyron.* (Trans. by C. & M. Humphrey) New York: Appleton-Century, 1932.

50. JENSEN, M. B. Reading deficiency as related to cerebral injury and to neurotic behavior. *J. appl. Psychol.*, 1943, 27, 535-545.

51. KENNEDY, R. J. R. *The social adjustment of morons in a Connecticut city.* Hartford: Mansfield-Southbury Social Service, 1948.

52. KLINEBERG, O. *Negro intelligence and selective migration.* New York: Columbia University Press, 1935.

53. KUGELMASS, I. N. *The management of mental deficiency in children.* New York: Grune & Stratton, 1954.

54. LEVINSON, B. M. Rethinking the selection of intellectually gifted children. *Psychol. Rep.*, 1956, 2, 127-130.

55. LEWIS, E. O. Mental deficiency and social medicine. *J. ment. Sci.*, 1948, 258-265.

56. McGEHEE, W., & LEWIS, W. D. The socio-economic status of the homes of mentally superior and retarded children and the occupational rank of their parents. *J. genet. Psychol.*, 1942, 60, 375-380.

57. MERRILL, M. A. The significance of IQ's on the Revised Stanford Binet Scale. *J. educ. Psychol.*, 1938, 29, 641-651.

58. MUENCH, G. A. A follow-up of mental defectives after eighteen years. *J. abnorm. soc. Psychol.*, 1944, 39, 407-418.

59. PENROSE, L. S. *The biology of mental defect.* New York: Grune & Stratton, 1949.

60. PHELPS, H. Postschool adjustment of mentally retarded children. *Except. Child.*, 1956, 23, 58-62; 91.

61. PRESSEY, S. L., & KUHLEN, R. O. *Psychological development through the life span.* New York: Harper & Brothers, 1957.

62. ROBERTS, J. A. F. The genetics of mental deficiency. *Eugen. Rev.*, 1952, 44, 71-83.

63. SCHILDER, P. Congenital alexia and its relation to optic perception. *J. genet. Psychol.*, 1944, 65, 67-88.

64. SILLER, J. Socio-economic status and conceptual thinking. *J. abnorm. soc. Psychol.*, 1957, 55, 365-371.

65. SKEELS, H. M., & FILMORE, N. A. Mental development of children from underprivileged homes. *J. genet. Psychol.*, 1937, 50, 427-439.

66. SKEELS, H. M., & DYE, H. B. A study of the effects of differential stimulation on mentally retarded children. *Proc. Amer. Ass. Ment. Def.*, 1939, 44, No. 1, 114-136.

67. SKODAK, M., & SKEELS, H. M. A final follow-up of one hundred adopted children. *J. genet. Psychol.*, 1949, 75, 85-125.

68. SLOAN, W. Some statistics on institutional provisions for the mentally handicapped. *Amer. J. ment. Defic.*, 1955, 59, 380-392.

69. SONTAG, L. W. Some psychosomatic aspects of childhood. *Nerv. Child.*, 1946, 5, 296-304.

70. SPITZ, R. A. The role of ecological factors in emotional development in infancy. *Child. Develpm.*, 1949, 20, 145-156.

71. SPITZ, R. A. Hospitalism: an inquiry into the genesis of psychiatric conditions in early childhood. In A. Freud, et al (Eds.) *The psychoanalytic study of the child.* Vol. 1. New York: International Universities Press, 1945, Pp. 53-74.

72. SPITZ, R. A. Hospitalism: a follow-up report on investigations described in Vol. 1, 1945. In A. Freud, et al. (Eds.) *The psychoanalytic study of the child.* Vol. II. New York: International Universities Press, 1946, Pp. 113-117.

73. SPRINGER, N. N. The influence of general social status on the emotional stability of children. *J. genet. Psychol.*, 1938, 53, 321-328.

74. STAGNER, R. Economic status and personality. *Sch. & Soc.*, 1935, 42, 551-552; 269.

75. STRAUSS, M. Subcultural variation in Ceylonese mental ability: a study of national character. *J. soc. Psychol.*, 1954, 39, 129-141.

76. TERMAN, L. M., & MERRILL, M. A. *Measuring intelligence: a guide to the administration of the new revised Stanford-Binet tests of intelligence.* Boston: Houghton Mifflin, 1937.

77. THOMPSON, C. W., & MAGARET, A. Differential test responses of normals and mental defectives. *J. abnorm. soc. Psychol.*, 1947, 42, 285-293.

78. THORNDIKE, E. L., & WOODYARD, E. Differences within and between communities in the intelligence of children. *J. educ. Psychol.*, 1942, 33, 641-656.

79. TODD, T. W. *Atlas of skeletal maturation (hand).* St. Louis: Mosby, 1937.

80. TOMPKINS, W. T. The clinical significance of nutritional deficiencies in pregnancy. *Bull. N.Y. Acad. Med.*, 1948, 24, 376-388.

81. TOWN, C. H. *Familial feeblemindedness.* Buffalo: Foster & Stewart, 1939.

82. TREDGOLD, R. F., & SODDY, K. *A textbook of mental deficiency.* (9th ed.) Baltimore: Williams & Wilkins, 1956.

83. WALLIN, J. E. W. *Mental deficiency.* Brandon, Vt.: Journal of Clinical Psychology, 1956.

84. WARNER, W. L., HAVIGHURST, R. J., & LOEB, M. B. *Who shall be educated?* New York: Harper & Brothers, 1944.

85. WEATHERWAX, J., & BENOIT, E. P. Concrete and abstract thinking in organic and non-organic mentally retarded children. *Amer. J. ment. Defic.*, 1957, 62, 548-553.

86. WECHSLER, D. *The measurement of adult intelligence.* (3rd ed.) Baltimore: Williams & Wilkins, 1944.

87. WECHSLER, D. *Manual for the Wechsler Adult Scale.* New York: Psychological Corp., 1955.

88. WEINGOLD, J. T. A plan for state and community action. *Amer. J. ment. Defic.*, 1957, 62, 14-25.

The Psychological Record, 1958, 8, 39-41.

EMOTION AND THE EVALUATIVE FEATURE OF ALL BEHAVIOR

S. HOWARD BARTLEY

Michigan State University

The recent *Record* articles of Brackmann (1) and Plutchik (2) on emotion are continuing evidences that psychology has not yet reached anything like a satisfactory envisagement of the subject despite the attention it has been given for a long time. These two articles reiterate some of the difficulties and make cogent suggestions. There seem, however, to be one or two suggestions regarding a primary revamping in the way the subject is looked upon that need to be included at this time. These suggestions should help to answer some of the questions that Brackmann and Plutchik raise.

It must first be recognized that in dealing with emotion one is faced with the very same principles as in dealing with behavior labelled in any other way. One must recognize that certain definitions in psychology must be organism-centered. It is something about the organism that forms the basis for making certain definitions of terms such as emotion, and it is something about the specific organism under study that forms the criteria for saying when emotion exists and when it doesn't, or what it is about behavior that is emotional. This is true even though it may be the interaction *between* the organism and the environment that occupy the attention of the student of behavior. Without using the organism as the determiner or reference for putting a piece of behavior into a given class, one can only describe in neutral terms the overt features of behavior and is left without a way of stating whether an act is to be considered an example of one class or another. The judge must have previously become well enough acquainted with the matters of concern to be able to do more than merely *describe*.

Another factor in solving the present problem is to recognize that all behavior is, in effect, evaluative. In every case, the organism reacts either as though the situation were harmful, or beneficial, or neutral. It would seem to be more fruitful to look at the matter this way than to lump the two extremes together under one label such as emotive behavior, and the middle under another, as though it did not belong in the same spectrum. To react to something as neither markedly beneficial nor harmful, is *in effect* to evaluate it just as truly as if the situation were reacted to in one of the other two ways. What we have been calling emotive behavior has been only the extremes. It is to be admitted that in the economy of the organism, or in the character of its reactions, it is something very different to have the extremes of behavior than to have the "calm, regular" reactions. It is also to be admitted that the extremes of behavior possibly merit special attention, but this special attention should not preclude our seeing the behavior in its proper context, or seeing it for what it is as far as essential classification is concerned.

In addition to evaluation of the environment's significance to the organism, the organism's evaluation of its own action is involved and must be taken into account. Evaluation is expressed in ensuing action or through concurrent feedback. Success or failure of action is determined in accord with the criteria that are involved. What we are saying here is to be considered true of all behavior, and we have said nothing as yet to define how we are going to apply the words *emotion* and *emotional*.

Emotion is that behavior that expresses a realization of failure to cope with the perceived demands of the situation. It goes without saying that this failure occurs particularly in cases in which extreme or subtle demands are recognized. This applies not only to those situations that call for acceptance but also to those that call for rejection, retreat or positive opposition. It occurs when puzzlement is involved in problem solution.

The *vigor* of external action, whether it be the "sham rage" of operated cats or the violent action in everyday reactions of other subjects, human or subhuman, is not a critical feature distinguishing emotion from other behavior. The criteria, as has already been implied, must have to do with organism-environment relations and with the ability of the organism to express these effectively. Much psychology seems to deal with organism-environment relations, but it seems that it circumnavigates the problem of characterizing the organism except for talking about "sets," etc., which are environment- rather than organism-defined.

It is to be admitted that setting up organism-defined concepts may involve imputation on the part of the observer or experimenter. This, at times, calls for the careful use of deduction from whatever evidence is available. When deduction becomes broadly enough based to form an effective system of regarding behavior, it comes about as close as we can expect to understandings such as we are seeking here. Our test is not whether a concept or statement stems from direct observation or from deduction, but rather whether the deduction proves experimentally and systematically useful.

In the present scheme we are faced with the question of whether to make "emotional" a term equivalent to "evaluational," or whether to make it pertain to a peculiar kind of evaluation. It would seem that the latter is required.

Failure to adjust is a very frequent, almost universal result in connection with evaluations that lie very far in either direction from the central neutral region in our spectrum. One need not be surprised if this be the case. For example: How can one completely "adjust" to meeting an enemy or a very dear friend? What is there to do that would fully meet the needs of the situation? Hence, there is always some degree of "failure" and the experience that is a familiar part of the emotion picture. But if I am called upon to add up a column of figures, there is a literal set of operations that will precisely and fully meet the needs of the situation. It is only when I am aware of a high probability that I cannot add, or when there is some "memory" of discomfort on previous similar occasions, or when I don't want the column added that the evaluative characteristics of the situation arise that are commonly called emotional. It is then that a "failure to adjust" arises.

In such cases the responding becomes somewhat internalized. All that is to be done in response to the stimulus cannot be expressed externally through the motor apparatus. A part of the internalization is the peculiar autonomic activity that is set into motion.

Since the factor of bias, set, alignment, etc., of the organism has been given a necessary place in defining emotion, a further discussion would certainly include the topics of (1) the genetic determination of reactions to "threat," such as are expressed in the startle response, etc., and (2) the learned orientations and stereotyped reactions to various classes of situations, etc. One question involved would be whether or not completely stereotyped responses to extreme conditions could be called emotive behavior, as is often the case in regarding them. The definition we have supplied would indicate that the crux of the matter lies in whether such behavior includes a "recognized" inadequacy. Since this, if it occurs, can only follow the initial reaction, some of the behavior may be emotional and some, not.

REFERENCES

1. BRACKMANN, J. F., JR. Some comments on the definition of emotion. *Psychol. Rec.*, 1957, 7, 93-95.
2. PLUTCHIK, R. Further comments on the definition of emotion. *Psychol. Rec.*, 1957, 7, 123-124.

The Psychological Record, 1958, 8, 43-47.

PATTERN VISION IN YOUNG INFANTS[1]

ROBERT L. FANTZ

Research Department, St. Vincent Charity Hospital, Cleveland

William James described the infant's world as a "great blooming, buzzing confusion" (4). Two questions might be asked regarding this statement: first, what kinds of sensations are contained in the confusion, and second, is the confusion relieved by the beginnings of perceptual organization? Relative to the first question, considerable progress has been made in determining the elementary sensory dimensions to which the young infant is sensitive. For example, responsiveness to the intensive and spectral features of photic radiation and to movement is present at an early age (7). Regarding the second question, little information is available about supposedly complex functions such as form and spatial vision which involve configurations of stimuli. Since relevant data are lacking, there is a tendency to assume that visual organization and patterning are absent before considerable experience and learning has occurred. More definite information is desirable for several reasons. First, pattern and spatial vision is, in the adult, the most reliable and important source of information about the environment, so that the onset and development of this function is of great interest. Second, this topic has played a major role in theories of perception and neural functioning (2, 3, 5, 6).

The methods available for testing young infants are limited by the lack of verbal, manual, and locomotor response indicators. However, eye activity itself, which is a prominent part of the infant's behavior, can provide a clue to what is seen and how it is organized. When under controlled conditions an infant repeatedly looks more at one target than at another, and thus shows a visual preference for certain parts of the spectrum, it may be supposed that color is seen and discriminated. In the same way, consistent visual attention to stimuli differing only in pattern, regardless of position, is evidence for form or pattern vision.

In brief, the method used in this study was that of recording the relative lengths of visual fixation by an infant of simultaneously-presented patterns. The aim was to determine whether this technique offered a solution to the difficulties in studying early visual development. A similar method, used to test a chimpanzee infant, is described more fully elsewhere (1).

Subjects

The Ss were 30 infants selected from the waiting list of a university nursery school on the basis of age and availability for repeated testing. The age varied from one to fourteen weeks at the first test. Weekly test sessions were given when possible until ten records had been obtained. Eight of the thirty Ss had to be dropped before this time due to persistent crying, fussing, or sleeping in the testing situation. Most of the results are based on the remaining 22 infants.

[1]This paper was read at the meeting of the Midwestern Psychological Association in Chicago, May, 1957. The research was carried out at the Institute of Child Welfare, University of California, Berkeley, under a postdoctoral research fellowship from the National Institute of Mental Health, U. S. Public Health Service, sponsored by H. E. Jones.

Procedure

The testing was carried out in the homes of the Ss in order to minimize disturbing factors. The infant was placed face up in a comfortable, form-fitting crib which prevented gross head and body movements. A uniform gray structure above the infant excluded vision of people or objects in the room and provided a background for two posterboard patterns. These patterns were located one ft. above the infant's head and were spaced one ft. apart. Illumination was provided from below the infant's field of view.

Four pairs of patterns were used during each test (Fig. 1). The identical triangles were included to control for the possibility of differential response to

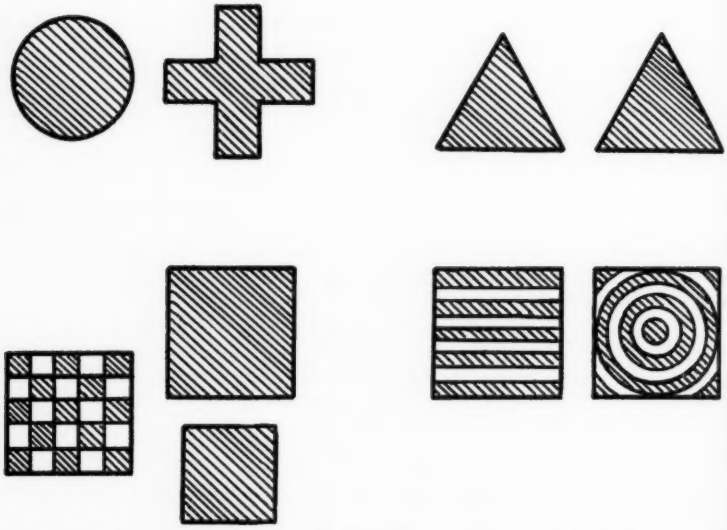

Fig. 1. The stimulus patterns drawn to scale; the large squares measured five inches on a side. Shaded areas were bright red; blank areas were gray to match the background. Adjacent patterns were presented together; the checkerboard was paired with either large or small plain square on a given exposure.

factors other than form or pattern differences. The cross and circle were equated in area. The bull's-eye and stripes patterns were equated in area of red and in outline form. The checkerboard was paired half of the time with the plain square of equal outline size and the remaining time with the smaller square equated in area of red. A duplicate set of patterns was used for part of the testing.

Each pair was presented twice in succession, with reversed right and left positions for the second exposure. Thus eight test periods, each 30 sec. long, were given during a weekly test session. The order of presentation of the four pairs was random, and the initial positions within each pair also varied randomly.

Between exposures the patterns were hidden from view by a gray shield which contained a 4-inch hole directly overhead. A test exposure did not begin until the infant was looking at this central hole. Thus, there was an equal chance of eye movements toward the two patterns when they were suddenly exposed to view. The infant's eyes were observed through a ¼-in. hole midway between the patterns. The total length of visual attention to each pattern was measured by pressing one of two telegraph keys while the corresponding pattern was fixated. Each key operated a timer. The time scores were then recorded at the end of the 30-sec. exposure.

It is difficult to be certain of the direction of gaze of an infant by unaided observation. This problem was solved by making use of the reflected images of the patterns. These images were clearly visible on the surface of the eyeball under proper lighting conditions. When a pattern was fixated, the image of that pattern coincided with the pupil of the eye. This provided a simple and reliable criterion of fixation.

The time scores for the two exposures of a pair of patterns were summated to balance out position preferences. Non-parametric tests of significance were used.

Results

Neither the control pair of triangles nor the cross and circle elicted consistent visual preferences. On the other hand, the two pairs presenting variations in type and degree of patterning gave results which were consistent both in successive tests and between *Ss*.

In total scores for all ten weekly sessions, 19 infants fixated the checkerboard more than the square, compared to only 3 favoring the square. The results were similar for exposures using the large or small squares. Twenty *Ss* showed higher time scores for the bull's-eye, compared to two for the stripes. Both preferences are significant at the .001 level, indicating that the ability to discriminate patterns was present during the first six months of age.

Fig. 2 shows developmental curves for the two pairs of patterns which gave significant overall results. An increase in the checkerboard preference is evident around eight weeks. A reversal from a stripes to a bull's-eye preference was shown at eight weeks.

The latter change was an unexpected and unexplained finding, although it is one of the most consistent aspects of the results. Of the 12 infants who were first tested before eight weeks of age, 11 showed a clear reversal of preference from stripes to bull's eye. The 10 older infants all showed a consistent bull's-eye preference. The change of preference could not have been caused by an unknown change in testing procedure, experimental conditions, or stimulus patterns during the course of the experiment, since it occurred at widely varying dates for different *Ss*, and with duplicate sets of patterns.

The preference reversal was not related to amount of testing experience, as may be seen in Fig. 3. This is a scatterplot between age and preference score for the first testing of each *S*. Of the 16 *Ss* under seven weeks, only 2 fixated the bull's-eye more than the stripes, while all 14 over seven weeks did so. The increase in checkerboard preference with age at first test was not as consistent as the other change, but still was significant at the .05 level. Of the 16 infants under 7 weeks, 10 preferred the checkerboard; of the 14 older infants, 11 preferred the checkerboard.

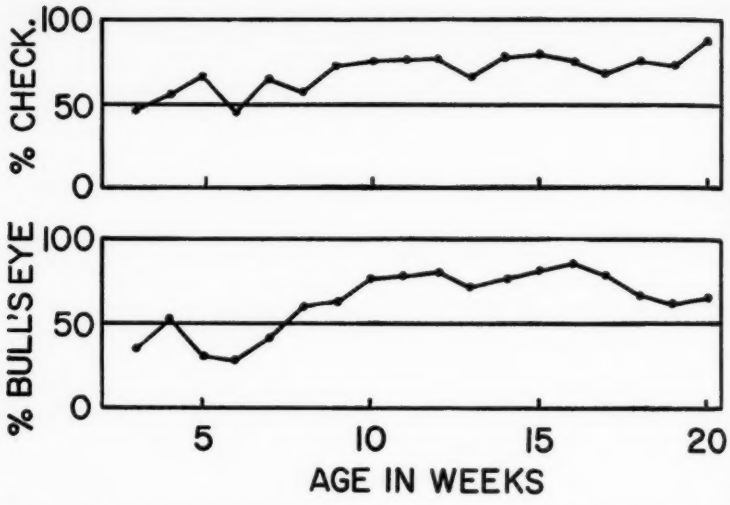

Fig. 2. Developmental preference curves for two pairs of patterns: checkerboard versus plain square and bull's-eye versus horizontal stripes. At each age is shown the relative amount of time for the two patterns out of the combined fixation time for both. Each point is the average for those Ss tested at that age; this number varies between 5 and 20 with the higher values at the middle ages.

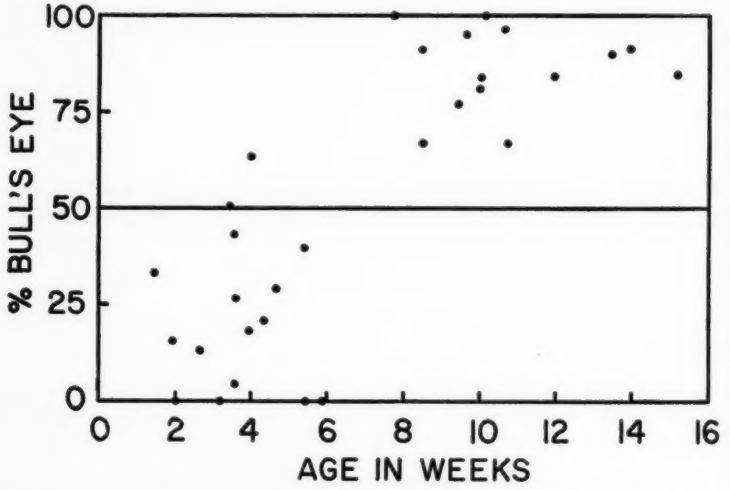

Fig. 3. A scatterplot between age at first test and preference for the bull's-eye or stripes pattern. Each point is based on the combined fixation time for the two patterns during two 30-sec. exposures for a single S. The *N* is 30, including those infants dropped later in the experiment.

It is clear that the age trends shown in Fig. 2 are due either to maturation or general visual experience, rather than to practice effects from repeated testing. The results for checkerboard versus square alone might suggest that the change represents an improvement in pattern vision with age. However, some differential was shown during the first six weeks. The consistent preference for stripes over bull's-eye during the same period of time gives further evidence against the possibility that a process of learning to see patterns occurred during the early weeks of life. The changes at eight weeks, on the other hand, could represent a modification of the original visual behavior due to a type of early visual learning such as Hebb postulates (3).

Similar results have been obtained from a chimpanzee infant tested from birth: consistent visual preferences were shown during the first six weeks with little opportunity for visual learning, while striking changes occurred at nine weeks which could be due either to maturation or to an intervening period of visual experience (1).

Conclusions

1. Visual patterns were discriminated by infants during the first six months, as evidenced by differential fixation times.

2. Changes in the strength or direction of the pattern preferences occurred around two months of age, independently of amount of testing.

3. Consistent visual preferences were present as early as the first two months, thus arguing against an extreme empiricistic view of the development of visual organization and pattern discrimination.

4. The determination of natural visual preferences among different stimuli is a powerful method of studying early visual development which can provide data of importance to theories of perception, learning, and neural functioning.

REFERENCES

1. FANTZ, R. L. Visual discrimination in a neonate chimpanzee. *Percept. mot. Skills.*, in press.
2. GIBSON, J. J. *The perception of the visual world.* Boston: Houghton Mifflin, 1950.
3. HEBB, D. O. *The organization of behavior.* New York: Wiley, 1949.
4. JAMES, W. *The principles of psychology.* New York: Holt, 1890.
5. KOHLER, W. *Dynamics in psychology.* New York: Liveright, 1940.
6. LASHLEY, K. S. The problem of cerebral organization in vision. In H. Kluver (Ed.), *Visual mechanisms. Biol. Sympos.*, 1942, 7, 301-322.
7. PRATT, K. C. The neonate. In L. Carmichael (Ed.), *Manual of child psychology.* New York: Wiley, 1954. Pp. 215-291.

The Psychological Record, 1958, 8, 49-52.

THE EFFECT OF BULBOCAPNINE ADMINISTRATION ON AVOIDANCE BEHAVIOR

T. VERHAVE and JOHN E. OWEN, JR.
The Lilly Research Laboratories

Bulbocapnine, an alkaloid derived from tubers of Corydalis bulbosa, or Cava plant[1], has been the subject of extensive pharmacological investigation (4). The only previously published experimental research concerning behavioral effects of the alkaloid has appeared in the Russian literature and is relatively inaccessible (1, 2, 5). Since the compound has depressant properties, it was considered of interest to determine its effects on the behavior of animals under conditions similar to those previously used to study the effects of other compounds with depressant properties, such as secobarbital and chlorpromazine (6, 7).

Method. — Fifteen male albino rats were used. The animals were selected at random from a large population of trained animals and divided into three groups. Three doses of bulbocapnine hydrochloride were used (16, 25 and 32 mg./kg.). Each group received a different dose. The compound was administered by subcutaneous route. Each rat was assigned to one of eight experimental cages enclosed in light-proof and sound-resistant boxes. The inside dimensions of these experimental cages were 10½ in. long, 5¼ in. wide and 8½ in. high. The sides and top of each cage were constructed of ⅛ in. Plexiglas, the front and rear walls of ¼ in. aluminum alloy, and the grid flooring of transverse metal rods, ⅛ in. in diameter. These rods were spaced at 1 in. intervals. Two 1/16 in.-thick stainless steel plates covered the entire inside of the plastic side walls. They were insulated from the aluminum end walls and the grid flooring. This arrangement permitted wiring the four walls separately into the shock circuit in order to minimize the occurrence of undesired avoidance behavior. The four walls and the floor rods were each successively opposed in polarity to all other elements in the system by a "grid scrambler" consisting of a series of microswitches operated by cams rotating at a high speed. Electric shock was provided by a constant current stimulator passing half-wave 60 cycle DC at 190 v. and .6 ma. The current stabilizing circuit employed has previously been described by Dinsmoor and Hughes (3).

The response required for both escape and avoidance behavior was the turning of a 4½ in.-wide brass wheel. The wheel was cylindrically shaped and mounted into one of the aluminum end walls. The center of the shaft on which it rotated was 4 in. above the grid flooring. The total wheel diameter was 13⅜ in. Eight ⅛ in.-diameter brass rods were inserted into brass end disks every 45°. The shaft was a ⅛ in. stainless steel rod mounted in miniature ball-bearings which were held in position by two small pillow block cases. A microswitch provided the friction on the wheel. It was mounted on the outside of the cage in such a manner that the switch was closed by each of the eight brass rods on the wheel.

The warning stimulus was an intermittent 24 v. DC buzzer which came on

[1]Also known as "Dutchman's breeches."

7 sec. before the shock. It continued for as long as the shock lasted. Simultaneously with the onset of the buzzer, a 28 v. pilot light mounted 1½ in. above the top part of the wheel was dimmed in brightness. This was due to a drop of 4 v. in the 28 v. DC power supply that provided the current (5 amp.) for the automatic control equipment that programmed the experiments. The shock was terminated automatically if no escape response occurred within 5 sec. after its onset. The intervals between warning stimulus presentations were varied randomly between 30 and 90 sec.; the mean interval was 60 sec. All rats were well trained before the start of the experiments. No drug was ever administered to any one rat until he had successfully avoided shock on at least 155 of 160 trials for 3 consecutive sessions. Since a small warm-up effect is observed in many animals during the beginning of the day's session, a 20-trial control period was given before administration of the drug. If a rat failed to make an avoidance response more than twice during these first 20 trials, no drug was administered on that day but postponed until the next session. At least three days were allowed between successive sessions. The rats were injected immediately after completion of the 20-trial control period. They were then put back into the experimental cage and run for 160 trials. The experiments were programmed automatically by means of relays and timers. Data were recorded on electric impulse counters.

The depressing effect of the compound under investigation is described in terms of the percentage loss of the escape and/or avoidance behavior. These data were calculated for each rat individually for each of 8 blocks of 20 successive trials. If, for example, during one of the 8 blocks of 20 trials, a rat failed five times to avoid shock and failed twice to escape from shock, the percentage losses for the avoidance and escape responding were 25 and 10 per cent respectively.

The dose-response relationship is summarized in terms of the area under the curve relating percentage avoidance loss to blocks of 20 successive trials. The area is calculated for each rat separately by summing his percentage losses during a particular session. The resulting figure is divided by 100 simply to decrease the size of the number. It is a combined index of potency and duration.

Results and Discussion. — The results of the administration of the various doses of bulbocapnine are presented in Table 1. The two higher doses produced a marked depression of the avoidance behavior during the first forty minutes after injection. More animals tend to be affected more severely and for a greater length of time as the dose increases. Because of this, the area under the time course curves is the simplest and most sensitive way to describe the dose-response relationship. Although there is considerable variability in the degree of the drug effect produced by any one dose in different animals, the results for the individual animal are essentially similar. Onset of the drug effect is rapid and the duration of action tends to be short. An hour after administration even the animals which received the largest dose have returned to their normal response level. The effects of chlorpromazine under identical conditions, except dose level, last considerably longer (6).

One interesting similarity of the present data to those of chlorpromazine and reserpine is the fact that even at the 32 mg./kg. dose none of the animals showed the slightest degree of escape response loss. The animals always terminated the shock on trials when they failed to avoid. This does not necessarily mean that these various compounds actually produce identical behavioral effects. The present experimental situation does not allow for the observation of behavior losses which might be described as a loss of discrimination or a loss of attention.

TABLE 1

MEAN PERCENTAGE LOSS OF THE AVOIDANCE RESPONSE DURING 8 BLOCKS OF 20 SUCCESSIVE TRIALS AFTER ADMINISTRATION OF 3 DOSES OF BULBOCAPNINE

TIME IN MINUTES AFTER DRUG ADMIN.			0-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160
RAT No.	DOSE mg./kg.	PREDRUG CONTROL	1	2	3	4	5	6	7	8
89	32	5	75	10	0	0	0	5	0	0
92		0	55	75	70	40	0	5	0	0
61		0	80	35	0	5	....	....	....	....
15		0	90	85	40	0	....	....	....	....
21		0	75	75	50	5	5	0	0	0
	MEAN		75	56	32					
	S. E.		6	14	14					
17	25	5	95	70	0	0	10	5	0	0
18		0	100	95	70	45	35	5	10	5
46		0	85	60	15	0	0	0	0	0
85		0	15	10	0	0	0	0	5	0
77		0	20	5	0	0	0	0	0	5
	MEAN		63	48						
	S. E.		19	18						
81	16	5	45	0	10	45	60	0	5	0
96		0	0	0	0	0	0	0	0	0
94		0	35	45	35	40	65	15	0	15
68		0	10	60	5	0	0	0	0	0
91		0	0	0	0	0	0	0	0	0

The present data confirm the conclusions of Russian investigators. They have previously described the loss of conditional reflexes before the loss of unconditional reflexes as a result of bulbocapnine administration (1, 2, 5).

One interesting aspect of the present limited set of data is that again, as with previously studied compounds, the area under the time course curves can be fitted to a simple linear equation (7). These data are presented in Figure 1. The function was fitted by the method of least squares.

Summary and Conclusions. — The effects of three doses of bulbocapnine on the behavior of rats in an instrumental avoidance conditioning situation were investigated. Even the largest dose, which produced close to maximal avoidance loss, produced no loss in escape responding.

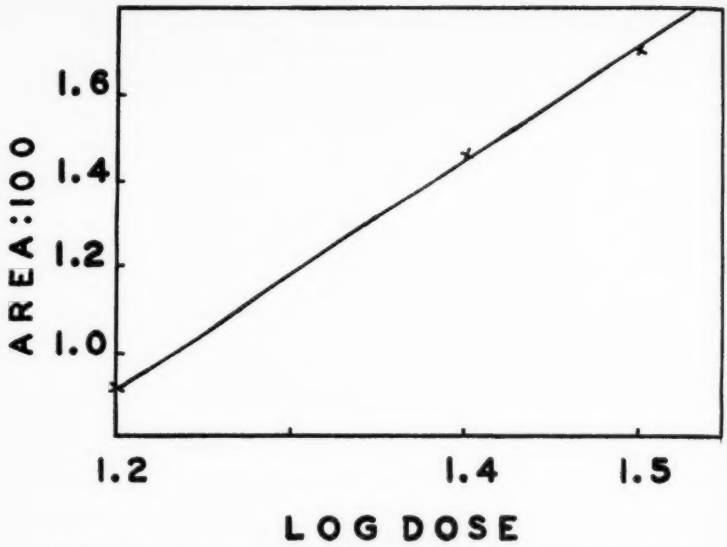

Fig.1. Area under the percentage avoidance loss time curve as a function of log dose.

REFERENCES

1. DERYABIN, V. S. The influence of bulbocapnine on alimentary conditioned reflexes. *J. Physiol. U.S.S.R.*, 1936, 20, (3).

2. DERYABIN, V. S. The influence of bulbocapnine on defensive (acid and motor) conditioned reflexes. *J. Physiol. U.S.S.R.*, 1940, 24, (5).

3. DINSMOOR, J. A., & HUGHES, L. H. Training rats to press a bar to turn off shock. *J. comp. physiol. Psychol.*, 1956, 49, 235-238.

4. de JONG, H. H. *Experimental catatonia.* Baltimore: Williams & Wilkins, 1945.

5. KOTLIAREVSKY, L. I. Disturbances of the higher nervous activity in animals caused by bulbocapnine intoxication. *J. higher nerv. Activ.*, 1951, 1, 579-602.

6. OWEN, J. E., JR., VERHAVE, T., & ROBBINS, E. B. Study of variability of the effects of secobarbital and chlorpromazine on escape and avoidance behavior. *J. Pharmacol. exper. Therap.*, 1957, 119, 174 (Abstract).

7. VERHAVE, T., OWEN, J. E., JR., & ROBBINS, E. B. Effects of secobarbital and pentobarbital on escape and avoidance behavior. *Psychol. Rep.*, 1957, 3, 421-428.

The Psychological Record, 1958, 8, 53-56.

PERSPECTIVES IN PSYCHOLOGY

VI. A NOTE ON THE COMPUTING MACHINE ANALOGY IN PSYCHOLOGY

PAUL SWARTZ
University of Wichita

> . . . Once it has been admitted that human behavior has its mechanical aspects, then it ought to be obvious that these are the aspects which the methods appropriate to the study of a mechanism will most readily reveal. If you study man by the method suited to chemistry, or even if you study him in the light of what you have learned about rats and dogs, it is certainly to be expected that what you discover will be what chemistry and animal behavior have to teach. But it is also not surprising or even significant if by such methods you fail to discover anything else.
>
> Krutch: *The Measure of Man.*

In an invited address delivered before the sixty-third annual meeting of the American Psychological Association, Dr. Robert Oppenheimer of *The Institute for Advanced Study* made the following incisive comment regarding the uncritical use of analogy in science. After acknowledging and illustrating the important contribution made by analogy to the development of scientific understanding, Oppenheimer declared:

> . . . probably between sciences of very different character, the direct formal analogies in their structure are not too likely to be helpful. Certainly what the pseudo-Newtonians did with sociology was a laughable affair; and similar things have been done with mechanical notions of how psychological phenomena are to be explained . . . . I know that when I hear the word "field" used in physics and in psychology I have a nervousness that I cannot entirely account for. I think that, especially when we compare subjects in which ideas of coding, of the transfer of information, or ideas of purpose, are inherent and natural, with subjects in which these are not inherent and natural, that formal analogies have to be taken with very great caution (5, pp. 133-134).

Dr. Oppenheimer is a physicist. Dr. Krutch, from whose work we quoted at the beginning of this note, is a man of letters and a naturalist. Both have only a peripheral association with professional psychology. Yet each is an astute critic of current trends in psychological thinking. With a few bold strokes of the pen both Oppenheimer and Krutch have skillfully bared the unfortunate predilection of many psychologists for using analogy uncritically and extravagantly. The same observation, largely unheeded, was made by J. R. Kantor almost two decades earlier. Two papers (1, 2), the first published in 1936, *Concerning Physical Analogies in Psychology*, and the second, appearing in

1938, *The Operational Principle in the Physical and Psychological Sciences,* both argue the point that "psychologists have persistently treated natural science principles as sheer analogies and not as intrinsic investigative tools" (2, p. 13), and that "analogical borrowings from the physical sciences" have done great harm and disservice by taking the place of actual, objective descriptions of psychological events.

Current fashions in analogical borrowing in psychology give eloquent testimony to the continuing acceptance of biological reductionism as the first principle of psychological science and to the pertinacious endurance of the traditional conception of physics as the model science. Consider, for example, the attempts of some psychologists to "explain" behavior by postulating structural and functional correspondences between the human brain and the computing machine. Meehl's adoption of this analogy in his 1955 Presidential Address to the annual meeting of the Midwestern Psychological Association is an excellent case in point (4). In this speech Meehl discussed the efficiency of the "rule-of-thumb" method of generating descriptions of personality from tests as compared with the "cookbook" method. In the former approach, "explicit rules are largely lacking, and . . . the clinician's personal experience, skill, and creative artistry" play a very important role. In the cookbook approach, on the other hand,

> any given configuration . . . of psychometric data is associated with each facet (or configuration) of a personality description, and the closeness of this association is explicity indicated by a number . . . . the essential point is that the transition from psychometric pattern to personality description is an automatic, mechanical, "clerical" kind of task, proceeding by the use of explicit rules set forth in the cookbook.

The data presented by Meehl argue strongly for the superiority of the cookbook method in generating personality descriptions. "From a theoretical point of view," he suggests,

> the trend is hardly surprising. It amounts to the obvious fact that the human brain is an inefficient recording and computing device. The cookbook method has an advantage over the rule-of-thumb method because it (a) samples more representatively, (b) records and stores information better, and (c) computes statistical weights which are closer to the optimal. We can perhaps learn more by putting the theoretical question negatively: when should we *expect* the cookbook to be inferior to the brain? The answer to this question presumably lies in the highly technical field of computing machine theory . . .

There is a commendable clarity and forthrightness in this exposition of the computing machine analogy which should not pass unnoticed. The author leaves no doubt as to his acceptance of the behavioristic reduction of psychological events to brain activity, and to his faith in engineering physics as the wellspring of psychological understanding.

It is freely admitted that the computing machine analogy may ultimately prove to be a very significant step forward in the development of psychological science. But the possibility, as suggested by the following considerations, seems a rather remote one. First, what is the empirical justification for reducing behavior to biological action? Surely, no psychologist would deny the proposi-

tion that stimulus factors are intrinsic components of every psychological event. Why then, in theoretical analysis, ignore them, or absorb them into brain action? If behavior is a *process,* involving the participation of both organism and stimulus factors, should not our constructions be based on this reality? The same argument applies to the necessity of considering the factors of setting and behavior history in describing any psychological event. Traditional brain dogma is a poor replacement for objective inquiry.

Second, even if we assume the behavioristic thesis to be valid, what is the empirical justification for expecting that computing machine theory is going to help us understand brain action? What studies in physiology support the computing machine analogy? Perhaps here the psychologist has fallen victim to the fallacy of unintentionally substituting a conceptual physiology for actual biological happenings. In this connection, we submit that any attempt to enrich the understanding of human physiology based on psychological investigation is an exceedingly dangerous enterprise.

Where are the analogies of yesteryear, the borrowings from Newtonian physics, from chemistry, from early biology, etc? How many have survived the inevitable sifting process of genuine psychological study? How many have been discarded as *barriers* to a scientific conception of behavior? In the historical record there is a wealth of information that illuminates the predominantly negative role played by analogy in the evolution of psychology.

There is an important problem of self-analysis in this matter of analogical borrowing that psychologists might profitably pause to consider. Why are we so eager to forfeit our birthright, to attribute to physics, or biology, or chemistry an investigative potential that we deny to ourselves? Perhaps, if we were more adept in taking an historical perspective in our work the predilection for analogical borrowing might be more easily curbed. It would be dangerously easy for psychology, with its wagon hitched to the star of quantitative analysis, to be reduced to a branch of one of the older, more established natural sciences. With no poetic pretensions, and with profuse apologies to Lewis Carroll, the following bit of doggerel is suggested as *possibly* being an accurate prediction of psychology's future:

"O psychologists," said the physicist,
"You've had a pleasant run!
Shall we be trotting home again?"
But answer came there none —
And this was scarcely odd, because
He'd absorbed them, every one.

In the final paragraph of his 1936 paper on physical analogies in psychology, Kantor (1) wrote: "We can only conclude that physical analogies can never help psychology reach the goal of a natural science." We know of no developments since that time which in any way alter the validity of this statement.

REFERENCES

1. KANTOR, J. R. Concerning physical analogies in psychology. *Amer. J. Psychol.*, 1936, 48, 153-164.
2. KANTOR, J. R. The operational principle in the physical and psychological sciences. *Psychol. Rec.*, 1938, 2, 3-32.
3. KRUTCH, J. W. *The measure of man.* New York: Grosset & Dunlap, 1954.
4. MEEHL, P. E. Wanted — a good cookbook. *Amer. Psychologist*, 1956, 11, 263-272.
5. OPPENHEIMER, R. Analogy in science. *Amer. Psychologist*, 1956, 11, 127-135.